Subject: MS Colloquium9/15-Leinaas-Bldg. 200/Auditorium
From: Nancy Sanchez <sanchez@anl.gov>
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MATERIALS SCIENCE COLLOQUIUM

SPEAKER: Professor Jon Magne Leinaas
University of Oslo

TITLE: Fractional statistics: Particles that are neither fermions nor bosons

DATE: Thursday, September 15, 2005

TIME: 11:00 a.m.

PLACE: **Building 200, Auditorium**

HOST: Suzanne te Velthuis

Refreshments will be served at 10:45 a.m.

Abstract: Basic quantum physics teaches us that the elementary particles of nature can appear in two different forms. They are either bosons, described by a symmetric many-particle wave function, or fermions, described by an antisymmetric wave function. This apparently simple difference gives rise to a completely different behaviour for a collection of articles, with the Pauli exclusion for fermions and the condensation phenomenon for bosons as the most striking difference. Although the restriction to these two types originally seemed to exhaust the possible types of quantum statistics for elementary particles, it was realized more than 25 years ago that if we could play with the number of physical dimensions, other possibilities might appear. Thus, in a two-dimensional world a continuum of intermediate types of statistics are conceivable, that interpolates between bosons and fermions. These types of generalized quantum statistics are now often referred to as fractional statistics and the particles that satisfy such unconventional statistics are commonly called anyons. In my talk I will review some of the basics behind the idea of fractional statistics, and discuss how geometry and topology is important. I will further discuss how fractional statistics is realized in certain quasi two-dimensional systems, and point to some unsolved problems. Although the idea of fractional statistics is no longer a new idea, it continues to pose interesting questions and it links up with other unsolved problems in a field of condensed matter physics we may call "exotic quantum states".